THE DUBIOUS HISTORY OF HEDGE FUND PERFORMANCE
1998 - 2014

Marc Freed • Van Eck Global • NYU Stern 1994
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Marc Freed - Hedge Fund Performance 1998 - 2014

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Prior to my time at NYU, I had received an MS in Management from MIT (1982) and an AB in Mathematics and Economics from Brown (1975).

I worked as a bond trader at Salomon Brothers between my times at MIT and NYU.

In 2002 I became a portfolio manager for Lyster Watson & Co., a small fund of hedge fund boutique.

In 2003 I developed a methodology for ranking hedge funds within homogeneous groups.

In 2010 I received US Patent #7,707,092 for this method of analyzing hedge fund performance over time.

In 2012 I sold the patent to Van Eck Global where I now manage $150mm in separate accounts and mutual funds based on the patented methodology.
Dick Sylla’s response to the first draft of this presentation was that it was about finance, not financial history.

While the analysis of this problem falls squarely in the realm of academic finance, I believe that the research itself qualifies as financial history because it covers a period of more than twenty years during which time hedge funds have evolved from the original form developed by Alfred Winslow Jones in 1948 into a multi-trillion dollar business that affects millions of investors, many of whom have no idea how their savings are being managed.

The data created by hedge fund databases, especially that available since 2001, makes it possible to evaluate many years of hedge fund performance in order to identify both their historic behavior and areas for additional research.
The modern, i.e. post WW II history of hedge funds begins with Alfred Winslow Jones who in 1949 launched a limited partnership that used leverage and that shorted as many stocks as it bought. Jones’ structure aimed to profit from changes in relative rather than absolute values of equities.

Fortune Magazine brought Jones to the attention of other aspiring money managers in 1966 when it pointed out his outperformance of traditional long-only funds over the preceding decade.

Others soon followed in his path. Most of these early funds traded equities as Jones did.

The number of hedge funds increased after the Fortune article appeared until the bear market of 1973-75.

This information is primarily from Wikipedia but may be found in many popular studies of hedge funds.
Hedge Fund Growth resumed with the equity market rally that began in August 1982.

Market conditions and technology created new opportunities for macro-economic speculation:
- High and volatile interest rates
- The explosion of US government debt
- Global financial deregulation
- The availability of computing power and its application to modern financial theory
- The development of exchange-traded financial futures and option markets

Most hedge funds launched in this period focused either on equities, like their predecessors, or on macro-economic trading involving bonds, currencies, equity indices and commodities.

Macro-trading came to a crashing halt when LTCM imploded in 1998.

Equity hedge funds imploded in 2000-2001 with the collapse of the internet bubble.
After 2001 hedge funds became significantly more specialized in specific areas of fixed income and equity markets. The number of fund strategies proliferated.

Prior to the collapses of LTCM and the internet bubble, funds typically charged management fees of 1% and profit-sharing fees of 20%. After those events, fees rose significantly. By 2008, a 1% management fee was rare and 2% was common.

To deter investors from redeeming funds from funds performing badly, funds began to restrict redemptions in two ways:

- By time, e.g. no redemption for the first year, and quarterly thereafter with 45 days notice
- By price, e.g. redeemable quarterly with 30 days notice but with a redemption fee of 1% if redeemed after one quarter declining by 1/3 of 1% in the next two quarters; then quarterly thereafter.
Strategy Taxonomy

- Relative Value & Arbitrage
  - Convertible Arbitrage
  - Statistical Arbitrage
  - Market Neutral Equity
  - Sovereign Fixed Income Arbitrage
  - Volatility Arbitrage
  - Relative Value Macro

- Event Driven
  - Merger Arbitrage
  - Distressed Investment
  - Capital Structure Arbitrage
  - Credit Strategies
  - Equity Event

- Directional
  - Long/Short Equity
    - Region
    - Sector
  - Long/Short Credit
  - Directional Macro
  - Emerging Market Debt
  - Commodity Trading Advisors
Long/Short Equity Fund Reclassification

Marc Freed - Hedge Fund Performance 1998 - 2014

March 2015
Long/Short Equity Fund Populations

![Graph showing the total USD-denominated funds reporting for 12 consecutive months over the years 2000 to 2014. The graph compares the performance of different categories of funds including LSENA, EVE, LSEWE, LSEDA, LSEGL, and LSEEM.]
The Original Problem I Intended to Solve

- **The Problem**
  - Decades of academic research on mutual fund performance have not prevented hedge fund managers from persuading institutional investors that they offer idiosyncratic benefits not subject to the same analysis applied to mutual funds. I rejected this assertion and set out to construct benchmarks for hedge fund performance that would subject them to the same analysis as mutual funds.

- **Hypothesis**
  - In the same way that the S&P 500 provides a good benchmark for comparative analysis of diversified equity mutual funds, so too would an accurate set of indices of hedge fund strategies provide benchmarks for funds practicing such strategies. If I could find or create such indices, then I could apply conventional performance measures to individual hedge funds to rank them within strategies.

- **Solution**
  - While developing strategy level indices using conventional portfolio analysis, I conceived an alternative statistic to the measures of Sharpe, Treynor and Jensen to rank hedge fund performance. In 2010 I received US Patent #7,707,092 on a “System and Method of Ranking Investment Performance.”
What I Found When I Solved It

- Hedge funds can be evaluated in the same way as mutual funds
- Hedge funds compare unfavorably to investable peer group indices
- Hedge fund mortality is extraordinarily high in comparison to that of equities
- The high mortality rate creates survivor bias in indices of a magnitude that ought to raise fiduciary and regulatory concerns
- The failure of regulators and investment consultants to recognize the actual performance of these assets that are widely held by large institutional investors managing the savings of uninformed investors raises additional questions of “regulatory capture”
- Most hedge fund investments are made by agents acting on behalf of investors who lack the ability and/or access required to evaluate such investments themselves. The poor investment outcomes experienced by hedge fund investors raises questions about this principal - agent relationship.
The following four charts report the performance of long/short equity funds that invest primarily in North American-listed equities from 2011-2014. All data is from the eVEstment hedge fund database.

The charts divide the period into two, 2011-2012 and 2013-2014. This allows us to observe the number of funds that reported in one period but not both.

The charts report:
- Performance in each period
- Performance in the whole period
- Mortality from period 1 to period 2
The chart shows the performance of 370 North American-focused Long/Short Equity hedge funds for the two year period of 2011-2012. It compares their performance to that of an investable index of ETFs developed from a regression analysis of their correlations to a broad range of risk factors captured by the ETFs.
This chart shows the performance of 295 hedge funds from the same universe for the two subsequent years.

The decline in the number of funds from 370 to 295 understates the actual amount of turnover.
This “migration” chart shows the actual paths followed by the original 373 funds that reported in 2011-2012.
An analysis that ignores Survivor Bias would say that 38% of funds out-performed this index. Most studies use non-investable indexes, e.g. HFRI, that actually underperform this non-investable index. The actual number is probably closer to the 25% that takes into account the dropouts.
Appendices

Non-investable Index Computation
Evaluating Active Management
Additional Research Topics
Non-investable Index Computation

- Assume equal distributions of assets to each fund in sample portfolios constructed from 12 monthly returns
- Determine the minimum sample size required to produce portfolios with distributions of returns and standard deviations that will not change with a larger sample size
  - Use a Kolmogorov-Smirnov test to compare portfolios containing $n$ and $n+1$ assets
  - Repeatedly fix the sample size equal to $n$ when both sets of portfolios appear to come from the same distribution
  - Fit the resultant distribution of sample sizes to a Gamma distribution and set sample size for the index calculation equal to the mean ($\alpha\beta$) of that distribution
- Calculate the minimum number of simulations required to produce such distributions
  - Calculate the number of simulations required to produce a sample variance belonging to the gamma distribution of sample sizes by backing out the sample size from the variance estimator $[1/(n-1)]\sum(MSE)$
  - Because the variance estimators are normally distributed, we can use their mean as the number of simulations required to compute the non-investable index of fund returns and standard deviations
Portfolio Possibility Sets

- Portfolio Possibility Sets are the core of the index computation. Philosophically the simulated portfolios are a Bayesian construct because they reveal outcomes that could have occurred as easily as those known to have occurred. In this sense, each simulation is analogous to a single fund that might or might not exist.

- Compute the required simulations of random 12 month portfolios of the selected sample size. For each simulated portfolio, compute the portfolio variance and use it to compute a standard deviation. The resulting returns and standard deviations constitute the Portfolio Possibility Set for the funds for the review period.

- Repeat the process for months 1-11 and use the 11 and 12 month returns to determine a return for the 12th month alone. This is the monthly non-investable index return.

- Fit the standard deviations of the simulated 12 month portfolios to a Gamma distribution. The mean of this distribution is the standard deviation of the non-investable index for the 12 month period.

- Use an F distribution to fit the returns of the simulated 12m portfolios to a Normal distribution, if possible, or to a Generalized Extreme Value distribution. The mean of the selected distribution is the return of the non-investable 12 month period.
USE PPS TO FIND INDEXES

PPS reveal the most common outcomes that investors in multiple funds experience.

With sets of homogenous funds, statistical analysis of PPS produces multi-factor indexes for the assets.
DIVERSIFICATION WORKS

The two-factor index captures the mean return of the funds precisely while revealing the benefits available to investors who diversify their allocations to multiple managers.

Managers have controlled volatility but not returns.
Non-investable LSENA Sharpe Ratios

DIVERSIFICATION HELPS SHARPE RATIOS

The rolling 12 month Sharpe Ratios of the non-investable index generally beat the mean Sharpe Ratios of the funds that comprise the index.

Risk reduction available from diversification has usually ranged between 2.5-5%.
SAMPLE SIZES & SIMULATIONS

Sample size has varied little over time. Generally 5-6 funds chosen randomly tend to match the performance of the non-investable index.

The number of simulations has varied more, but not by much until recently.
Hypothesis

- Most active managers understand that they cannot control returns but that they have some ability with diversification to manage volatility as measured by standard deviation of returns.

- If this is so, then an evaluation of active managers ought to measure consider both return and standard deviation.

- The Sharpe Ratio does this but it does not include any measure of the market environment in which the funds have operated.
USE THE TWO-FACTOR INDEX TO CREATE A STRATEGY MARKET LINE

We define the beta $\beta_S$ of each hedge fund strategy as a two-factor index comprising a return $R_S$ and a standard deviation $\sigma_S$ for a portfolio returning the given strategy’s average return and its correlation-adjusted standard deviation.

Given $\beta_S$ and a riskless asset with return $R_F$, one can draw a Strategy Market Line that illustrates the range of returns available from portfolios comprising only allocations to cash and $\beta_S$. 
Orthogonal Indexation treats the entire market line as an infinite set of indices against which to measure individual fund performance independently of leverage.

A fund’s perpendicular distance from the SML is its Orthogonal Index Score (‘OIS’). The intercept on the SML is its Orthogonal Index.

The Orthogonal Index with zero leverage is the strategy’s beta ($\beta_S$). This allows us to view the Strategy Market Line as the Zero Alpha line.
In 2010 the US Patent Office granted patent protection to me as the inventor of a “System and Method for Ranking Investment Performance”

The patent covers two main points:

- the treatment of a market line as an infinite series of indices (“orthogonal indices”): and
- the computation of alpha as the perpendicular distance from an orthogonal index and an investment portfolio mapped in risk-return space.
Decomposition of Returns into $\alpha$ and $\beta$

Measuring True $\alpha^{\circ}$ from a fund's Orthogonal Index $B_A$ allows us to decompose its return into four parts.

- $R_F$ (riskless return)
- $R_S - R_F$ (net Behavioral $\beta_S$ return)
- $R_{BA} - R_S$ (net leveraged $\beta_S$ return)
- $R_A - R_{BA}$ (manager alpha)

Alpha is based solely on the adjustment to risk and return achieved by a fund, e.g. $A$, relative to its Orthogonal Index on the market line, e.g. $B_A$. 

\[ R_A = R_F + R_{\alpha A} + R_{\beta A} + \alpha_A \]

\[ \alpha_A = \beta_A (\sigma_{BA}, R_{BA}) - \sigma_A (\sigma_A, R_A) \]
SHARPE RATIOS & ORTHOGONAL INDEX SCORES

All funds on a line parallel to the SML have the same True \( \alpha \) score.

\[
R_{\alpha A} = R_{\alpha B}, \quad -s_{\alpha A} = -s_{\alpha B} \Rightarrow \alpha_A = \alpha_B
\]

Their Sharpe Ratios, the slopes of the green dotted lines, differ because their calculation does not involve the market line.
One Sharpe Ratio to Rule Them All

ONE SHARPE RATIO RULES QIS

Market Sharpe Ratio =
\[ \tan \theta = \frac{R_S - R_F}{\sigma_S} \]
The ratio of True \( \alpha^\circ \) risk reduction to return augmentation also =
\[ \tan \theta = \frac{\sigma_{\alpha A}}{R_{\alpha A}} \]
So a manager’s ability to add True \( \alpha^\circ \) =
\[ 1 / \text{Market Sharpe Ratio} \]
The higher the Sharpe Ratio, the more important the role of risk reduction in \( \alpha \) generation. The lower the Sharpe Ratio, the more important the role of return production in \( \alpha \) generation.
OIS Distributions Explain Fat-Tailed Behavior of Funds

This stem chart of orthogonal index scores for LSENA funds is a typical example of the distribution one observes for all strategies at almost all times. Small percentages of funds perform much better or much worse than the group as a whole - with many more poor performers than superior ones.

Viewed over time there is almost no persistence among top performers, but some among poor ones.
I have completed additional research on the following topics:

- **Investable long/short equity index computation**
  - How I construct portfolios of ETFs with > 90% correlations to the non-investable hedge fund indices
- **Investable index history**
  - Historical performance of the investable long/short equity indices, monthly 2003 - present
  - Historical performance of individual hedge funds versus the investable indices, monthly 2003 - present

I have published the following papers on these hedge fund topics:

- **Journal of Wealth Management, Winter 2011**
  - “Investible Benchmarks and Hedge Fund Liquidity (with Ben McMillan)"
- **Journal of Indexes, November - December 2013**
  - “Hedge Fund Indexation and Replication”
Widescreen Test Pattern (16:9)

Aspect Ratio Test

(Should appear circular)